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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
MARIAM, DANIEL G	

ART UNIT	PAPER NUMBER
2624	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/681,961	SMITH PETER ET AL.	
	Examiner	**Art Unit**	
	DANIEL G. MARIAM	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.
2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.
  4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) *1-12,14 and 16-25* is/are rejected.
7)☒ Claim(s) *13,15 and 26* is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
  Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
  Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  a)☐ All b)☐ Some * c)☐ None of:
    1.☐ Certified copies of the priority documents have been received.
    2.☐ Certified copies of the priority documents have been received in Application No. _____.
    3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
  * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
  Paper No(s)/Mail Date *10/9/03*.
4) ☐ Interview Summary (PTO-413)
  Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 12 and 22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 12 recites the limitation ". . an integer fraction of a period of the ac reference signal. . " It is unclear what values or numbers are included or excluded by the integer and/or the period of the ac reference signal. Furthermore, does this mean the system automatically carries out what appears to be a mathematical operation without knowing their values or range of values? Likewise, a similar limitation also occurs in claim 22. Please clarify.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-6, 8, 11, 14 and 16-21 are rejected under 35 U.S.C. 102(e) as being anticipated by Bamji, et al (6,580,496).

With regard to claim 1, Bamji, et al discloses systems for CMOS-compatible three-dimensional image sensing using quantum efficiency modulation, comprising: (a) a two-dimensional (2-D) array (item 230) of photodetectors (item 240) for example for receiving reflected or scattered light from the scene, i.e., target object, illuminated by the light source (item 220) with the light being imaged onto the 2-D array of photodetectors, and with each photodetector in the 2-D array generating therefrom an electrical output signal (See for example, drawing illustration of Fig. 3 for the above-identified items and their associated text); (b) a plurality of modulators (item 250) associated with each photodetector in the 2-D array, each modulator receiving the electrical output signal from that photodetector and an alternating current (ac) reference signal (which corresponds to a sinusoidal signal: item 225, in Fig. 3, for example) with a different phase delay, i.e., variable phase delay, for each modulator, and generating a modulated output signal from each modulator associated with that photodetector (See for example, Fig. 3; col. 9, lines 23-24; and col. 10, line 59 – col. 11, line 61); (c) a plurality of integrators associated with each photodetector, each integrator receiving the modulated output signal from one of the plurality of modulators, and generating therefrom an integrator output signal for each integrator associated with that photodetector (See for example, item 330, in Figs. 4 and 9); and (d) a computational unit receiving each integrator output signal associated with each photodetector and generating therefrom intensity, i.e., brightness, and range, i.e., distance, information about the scene illuminated by the light source to generate the 3-D image of the scene (See for example, item 280, in Fig. 3; col. 14, lines 18-32; Abstract; and Figs. 4 and 9).

With regard to claim 2, the apparatus of Claim 1 further including an optical element, i.e., lens, located proximate to the 2-D array of photodetectors to image the reflected or scattered light thereon (See for example, col. 9, lines 51-59).

With regard to claim 3, the apparatus of Claim 1 wherein the 3-D image of the scene is generated in response to a single pulse of light from the light source (See for example, item 220, in Fig. 3).

With regard to claim 4, the apparatus of Claim 1 wherein the light source comprises a laser or a light-emitting diode (See for example, col. 9, lines 41-64).

With regard to claim 5, the apparatus of Claim 1 wherein the 2-D array of photodetectors is located on a first substrate, and the plurality of modulators are located on a second substrate (Given the broadest reasonable interpretation it reads on item 210, in Fig. 3).

With regard to claim 6, the apparatus of Claim 5 wherein the first and second substrates are superposed one above the other and electrically connected together (See items 240 and item 250 respectively of within the array 230, in Fig. 3).

With regard to claim 8, the apparatus of claim 1 wherein each photodetector comprises a silicon photodetector (See for example, col. 9, line 48).

With regard to claim 11, the apparatus of claim 1 wherein the electrical output signal from each photodetector is filtered or amplified or both prior to being provided to each modulator associated with that photodetector (See for example, item 400, in FIG. 9).

With regard to claim 14, the apparatus of claim 1 wherein the plurality of integrators associated with each photodetector in the 2-D array comprises three integrators (which reads on one of Figs. 4 and 9).

Claims 16, 17, 18, 19, and 21 are rejected the same as claims 1, 2, 3, 4, and 11 respectively except claims 16, 17, 18, 19, and 21 are directed to method claims. Thus, arguments similar to those presented above for claims 1, 2, 3, 4, and 11 are respectively applicable to claims 16, 17, 18, 19, and 21.

With regard to claim 20, the method of Claim 16 wherein the step for generating the electrical output signal from each photodetector comprises transforming a photocurrent signal generated by the photodetector in response to detected light into a voltage signal (See for example, col. 24, lines 13-30).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bamji, et al (6,580,496) in view of Dausch (7,026,602)

With regard to claim 7, Bamji, et al discloses all of the claimed subject matter as already addressed above in paragraph 4, and incorporated herein by reference. While Figure 3 of Bamji does show the electrical connection of the modulators and photodetectors on the partitioned substrate of IC 210, Bamji does not expressly call for making the connection using solder bump bonds. However, Dausch (See for example, col. 13, lines 40-50) teaches this feature. Therefore, it would have been obvious to one having ordinary skill in the art to incorporate the teaching as taught by Dausch, if for no other reason than to electrically join one surface to another using solder bump.

With regard to claim 10, the apparatus of Claim 1 wherein each photodetector comprises a mercury cadmium telluride (HgCdTe) photodetector (See col. 11, lines 19-20 of Dausch).

7. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bamji, et al (6,580,496) in view of Kaneshiro, et al (5,513,021).

With regard to claim 9, Bamji, et al discloses all of the claimed subject matter as already addressed above in paragraph 4, and incorporated by reference. While Bamji, et al discloses a generic photodetector, Bamji, et al does not expressly call for wherein each photodetector comprises an indium gallium arsenide (InGaAs) photodetector. However, Kaneshiro, et al (col. 6, lines 36-46) teaches this feature. Therefore, it would have been obvious to one having ordinary skill in the art to incorporate the teaching as taught by Kaneshiro, et al into the system of Bamji, et al, and to do so would at least improve the sensitivity of the photodetector.

8. Claims 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bamji, et al (6,580,496) in view of Kakiuchi, et al (6,822,687).

With regard to claim 23, Bamji, et al discloses (a) a two-dimensional (2-D) array of photodetectors, with each photodetector in the array receiving reflected or scattered light from the illuminated scene, i.e., target object, and generating therefrom a photodetector output signal (See for example, Fig. 3 and its associated text. Applicants' attention is also invited to the arguments presented above with respect to claim 1); (b) at least two modulators receiving the photodetector output signal from each photodetector and generating a modulator output signal which is a product of the photodetector output signal and an alternating current (ac) reference signal, with the ac reference signal (item 225) for each modulator having the same frequency and a different phase delay, i.e., variable phase delay (See for example, Figs. 3 and 4 and their associated text. Applicants' attention is also invited to the arguments presented above with respect to claim 1); (c) an integrator connected to receive the modulator output signal from each modulator and to generate therefrom an integrator output signal by integrating the modulator output signal over time (See for example, Fig. 4 and its associated text. Applicants' attention is also invited to the arguments presented above with respect to claim 1); and (d) a computational unit for receiving each integrator output signal and generating therefrom the 3-D image of the scene (See for example, item 280, in Fig. 3; col. 14, lines 18-32; Abstract; and Figs. 4 and 9). Bamji, et al does not expressly call for a three-dimensional (3-D) imaging camera. However, Kakiuchi, et al (See Figs. 13 and 14) teaches this feature. Therefore, it would have been obvious to one having ordinary skill in the art to incorporate the teaching as taught by Kakiuchi, et al into the system of Bamji, et al so as to acquire the three dimensional image of the target object using a three-dimensional imaging camera.

With regard to claim 24, the 3-D imaging camera of claim 23 wherein the light source comprises a laser or a light-emitting diode (See for example, col. 9, lines 41-64 of Bamji, et al).

With regard to claim 25, the 3-D imaging camera of claim 23 further comprising an optical element, i.e., lens, for imaging the reflected or scattered light from the illuminated scene onto the 2-D array of photodetectors (See for example, col. 9, lines 51-59 of Bamji, et al).

Allowable Subject Matter

9. Claims 13, 15 and 26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL G. MARIAM whose telephone number is 571-272-7394. The examiner can normally be reached on M-F (7:00-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MATTHEW BELLA can be reached on 571-272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DANIEL G MARIAM
Primary Examiner
Art Unit 2624

May 3, 2007